MEC-5004

Fanless Embedded PC with Low Power Consumption

Version：A1

Announcement

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Safety Instructions

1. Please read the user's manual carefully before using the product.
2. Before inserting, removing or re-configuring motherboard or expansion card, first disconnect the computer and peripherals from their power sources;
3. Before removing boards or computer, first turn off all power resources and disconnect the power cord from power source;
4. For whole set, when inserting or removing boards, first disconnect the computer and peripherals from their power sources;
5. Before you connect or unplug any signal cable, make sure all power cords are unplugged in advance;
6. To avoid power on/off computer frequently, wait at least 30 seconds after turning off the computer before re-turning on the computer.
7. Static electricity can harm system boards. Perform service at an ESD workstation and follow proper ESD procedure to reduce the risk of damage to components;
8. If there's no ESD workstation, You can take the following steps to prevent damage from electrostatic discharge (ESD):
    a) Wear a grounded wrist strap against your skin to eliminate static on your body;
    b) Always touch the metal chassis or frame before you touch any components in the chassis;
    c) Keep part of your body in contact with the metal chassis to dissipate the static charge while handling components;
    d) Avoid all unnecessary movement;
    e) Handle components and boards with care. Don't touch the components or contacts on a board. Hold a board by its edges or by its metal mounting bracket;
    f) Place the components on a grounded, static-free surface. Use a conductive foam pad if available but not the component wrapper.
    g) Do not let the components slide on the operating platform.
9. Use cross head screwdriver to operate. A magnetic screwdriver is recommended (magnet to collect screws). Do not leave any tools or screws inside the chassis;
10. Assure abundant cooling and streamline ventilation.

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Chapter 1 Product Introduction

Overview

MEC-5004 is a sort of fanless Core 2 Duo embedded PC with low power consumption; the al-alloy chassis has good-performance on airproof, dustproof, heat-dispersion and anti-vibration; the motherboard adopts Intel Core2 DuoU7500 or L7500 processor with low power consumption; Intel GM965+ICH8M-E chipsets integrating GMAX3100 graphic processing could share display memory in vast range; it also supports VGA and DVI independent dual-display, which could be widely used in GPS, intelligent transportation, digital video controlling system and so on.

Features and Specification

CPU

Intel Core Duo U7500/L7500.

Chipset

Intel GM965+ICH8M-E.

System Memory

One SODIMM slot, support 2GB DDR2 533/667MHz memory.

Network Function

One PCI-E x1 RTL8111C Gigabit Ethernet chipset; one Intel 82566MC Gigabit Ethernet chipset.

Video Function

Built-in Mobile Intel® Graphics Media Accelerator X3100; support LVDS output, LVDS and CRT could display simultaneously; also support TV output.

Audio Function

On board a standard AC'97 audio effect chipset, provide excellent sound-effect.

Expansion Bus

One PCI-E expansion slot; one PCI expansion slot.

I/O Function

- Four USB interfaces on the front, one PS/2 keyboard/mouse interface, one S-video interface and a set of audio interfaces;
- The rear IO board provides two Gigabit Ethernet ports, one VGA interface, one DVI interface, one GPIO interface, five COM ports and two USB interfaces.

Power Supply Selection

Wide voltage DC9V～36V/DC12V dual-input, redundancy power supply.

Main Performances

Environment/ Weight and Dimensions

- Dimensions: 242.00 mm(W) x 265.00 mm(D) x 100.00 mm(H)
- Weight: 4.5 Kg
- Operating Temperature: -10°C~+55 °C
- Relative Humidity: RH=93% (non-condensing);
- Non-Operating Temperature: -40°C~ +60°C

EMC Compliance

1. Limit of Interference of Electromagnetic Product

- Limits of radio disturbance is compliant with GB 9254-1998, class A.
- Harmonic current is compliant with the limits of GB/T 17625.1-1998, class D.

2. Anti-interference Capacity of Electromagnetic Product

- Electrostatic discharge immunity test is compliant with GB/T17626.2-98, class 3.
- Immunity test of radiation from radio frequency electromagnetic field is compliant with GB/T17626.3-98, class 2.
- Immunity to conducted disturbances induced by radio-frequency fields is compliant with GB/T17626.6-98, class 2.
- Electrical Fast Transient Burst Immunity-test is compliant with GB/T17626.4-98, class 2.
- Voltage dips, short interruption and voltage variations immunity tests are compliant with GB/T17626.11-98.
- Surge test is compliant with GB/T17626.5-99, class 2.

Reliability

- MTBF≧5000h;
- MTTR≦0.5h;

Safety

Meet the requirements in 1.7 “marking and instruction” and 2.3, 2.9 “electric structure” of GB 4943.

Mechanical Adaptability

- Anti-vibration: amplitude 5-19Hz/1.2mm; acceleration 19-200Hz/1.2g;
- Anti-shock: acceleration 15g, duration 11ms.

Requirements of Transportation and Storage

- **Transportation:**

Well-packaged products suit for transportation by truck, ship, and plane. During transportation, products should not be put in open cabin or carriage. When transshipping en route, products should not be stored in the open without protection from the atmospheric conditions. Products should not be transported together with inflammable, explosive and corrosive substances and are not allowed to be exposed to rain, snow and liquid substances and mechanical force.

- **Storage:**

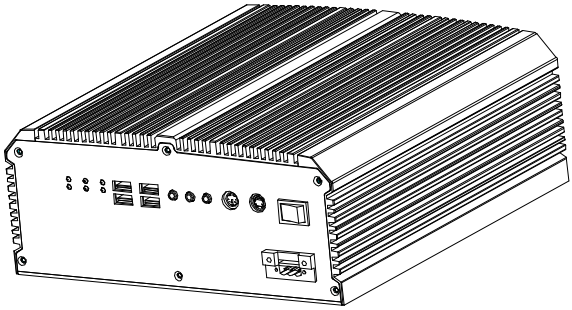
Products should be stored in package box when it is not used. And warehouse temperature should be 0°C~40°C, and relative humidity is 20%~85%. In the warehouse, there should not be harmful gas, inflammable, explosive products, and corrosive chemical products, and strong mechanical vibration, shock and strong magnetic field affection. The package box should be over ground at least 10cm height, and 50cm away from wall, thermal source, and vent.

Troubleshooting

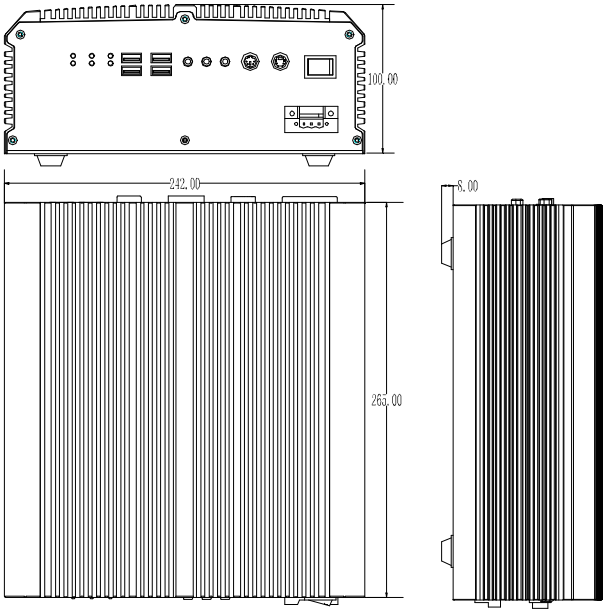
Please refer to *Common Trouble Analysis* and *Treatment of Industrial Control Computer* for a detailed description of the troubleshooting.

Chapter 2 Installation

Product Outline

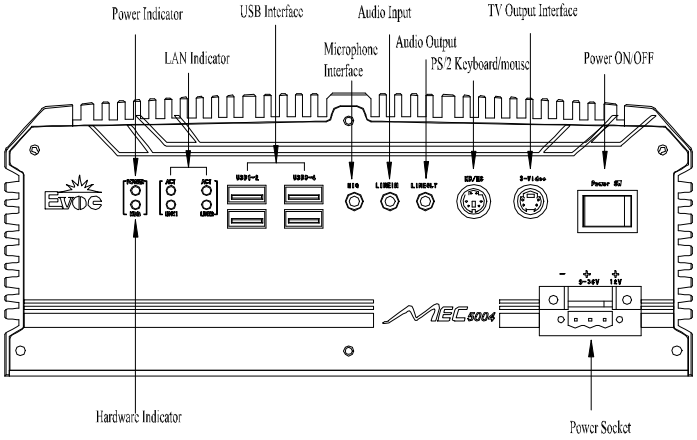


Product Dimension

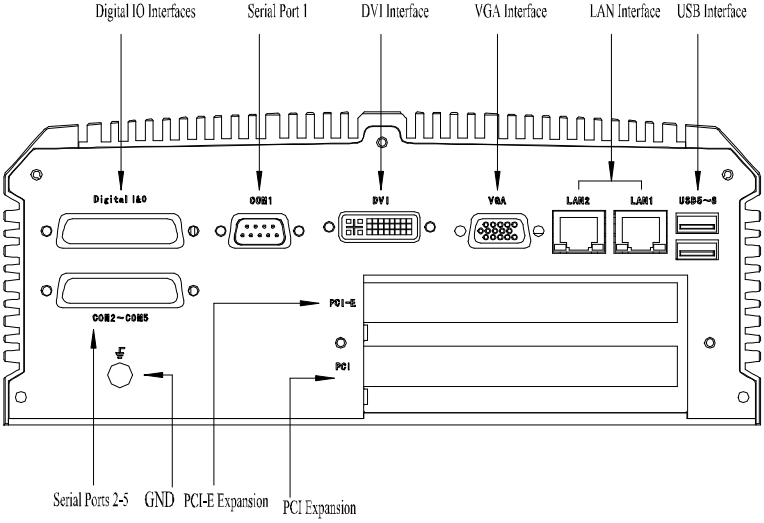


Unit: mm

External I/O Interfaces Outline

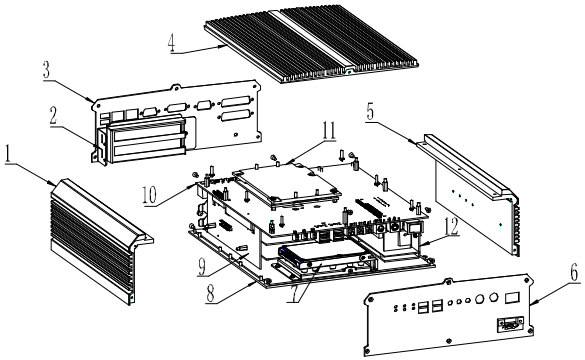


Front Panel IO Interfaces



Rear Panel IO Interfaces

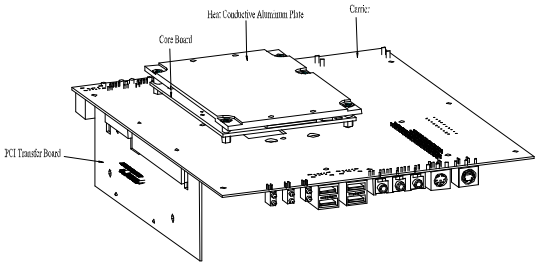
Assembly Explanation



1. Left Panel	2. I/O Frame	3. Rear Panel
4. Cover	5. Right Panel	6. Front Panel
7. Hard Disk	8. Bottom Cover	9. PCI Transfer Board
10. Carrier	11. Heat Conductive Aluminum Plate	12. Power

Critical Piece Installation

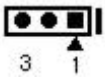
When assembling the core board, please assemble the heat conductive aluminum plate, the core board and the carrier together firstly and then install it into the machine so as to ensure the core board is securely connected with the interfaces on board. PCI transfer board can be inserted to the slot directly and fixed to the left panel with screws.



Introduction on Special Interfaces

Select different interface modes through setup the jumper on the board.

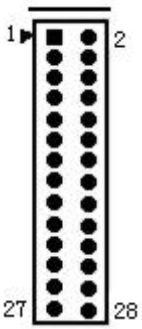
1. Selection for the Compact Flash Card Power (JCF1)



JCF1

Setup	Function
[1-2] Short	+3.3V
[2-3] Short	+5V (Default)

2. Selection for the COM1 RS-232/RS-422/RS-485 Mode (JPCOM1)

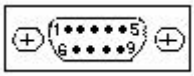


JPCOM1

Setup	Function
[1-2] Short [3-4] Short [5-6] Short [7-8] Short [9-10] Short [11-12] Short Other pins are disconnected	RS-232 Mode
[13-14] Short [15-16] Short [17-18] Shorted [19-20] Shorted [21-22] Shorted [23-24] Shorted Other pins are disconnected	RS-422 Mode
[17-18] Shorted [19-20] Shorted [21-22] Shorted [23-24] Shorted [25-26]Shorted [27-28] Shorted Other pins are disconnected	RS-485 Mode

Serial Ports and Digital IO Interface

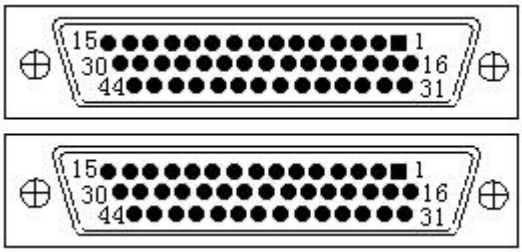
Provide five serial ports and two sets of 8-lane digital I/O interfaces; one of the serial ports is a standard DB9 interface (COM1). Through jumper setup, users can implement mode selection among RS-232/RS-422/RS-485. In addition, the four serial ports COM2, COM3, COM4 and COM5, switched from interface J1, could connect with devices with standard RS-232 interface, like mouse, modem, digital camera and so on.



COM1

Pin	Signal Name		
	RS-232	RS-422	RS-485
1	DCD#	TXD-	Data-
2	RXD	TXD+	Data+
3	TXD	RXD+	X
4	DTR#	RXD-	X
5	GND	GND	GND
6	DSR#	X	X
7	RTS#	X	X
8	CTS#	X	X
9	RI#	X	X

Interface Definition of COM2, COM3, COM4, COM5 and GPIO:



J1

Pin	COM2, COM3 Signal	Pin	COM4, COM5 Signal
1	COM2_DCD-	23	GND
2	COM2_RXD	24	COM4_DTR-
3	COM2_TXD	25	COM4_DSR-
4	GND	26	COM4_RTS-
5	COM3_DCD-	27	GND
6	COM3_RXD	28	COM5_DTR-
7	COM3_TXD	29	COM5_DSR-
8	GND	30	COM5_RTS-
9	COM4_DCD-	31	COM2_CTS-
10	COM4_RXD	32	COM2_RI-
11	COM4_TXD	33	GND
12	GND	34	GND
13	COM5_DCD-	35	COM3_CTS-
14	COM5_RXD	36	COM3_RI-
15	COM5_TXD	37	GND
16	COM2_DTR-	38	GND
17	COM2_DSR-	39	COM4_CTS-
18	COM2_RTS-	40	COM4_RI-
19	GND	41	GND
20	COM3_DTR-	42	GND
21	COM3_DSR-	43	COM5_CTS-
22	COM3_RTS-	44	COM5_RI-

Note: The corresponding relationship between the four serial ports (COM2, COM3, COM4, COM5) and external wire silk-screen is showed as follows:

Serial Port	COM2	COM3	COM4	COM5
Silk-screen	D	C	B	A

Pin	GPIO Signal Name	Pin	GPIO Signal Name
1	INPUT0	23	OUTPUT7
2	INPUT1	24	GND
3	INPUT2	25	GND
4	INPUT3	26	GND
5	INPUT4	27	GND
6	INPUT5	28	GND
7	INPUT6	29	GND
8	INPUT7	30	GND
9	GND	31	VCC3.3
10	GND	32	VCC3.3
11	GND	33	GND
12	GND	34	GND
13	GND	35	GND
14	GND	36	GND
15	GND	37	GND
16	OUTPUT0	38	GND
17	OUTPUT1	39	GND
18	OUTPUT2	40	GND
19	OUTPUT3	41	GND
20	OUTPUT4	42	GND
21	OUTPUT5	43	GND
22	OUTPUT6	44	GND

Chapter 3 BIOS Introduction

For more information about BIOS setup, please refer to our *AMI BIOS Setup Guide.*

Chapter 4 Installation of Drivers

Regarding the installation of the driver program of the product, please refer to the CD of associated PC.

Appendix

Digital IO Programming Guide

```
#define open {outportb(INDEXP,0x87)；outportb(INDEXP,0x87)；}

int INDEXP=0x2e；
int DATAP=0x2f；
int HardwareID=0；

short SetIndexData()
{
    outportb(INDEXP,0x87)；
    outportb(INDEXP,0x87)；
    outportb(INDEXP, 0x20)；
    HardwareID = inportb(DATAP)；

    If (HardwareID==0xff)
    {
        INDEXP= 0x4e；
        DATAP = 0x4f；
    }
    return    0；
}

void write (int reg ,int data)
{
    outportb(INDEXP,reg)；
    outportb(DATAP,data)；
}

int read(int reg)
```

```
{
        int value;
        outportb(INDEXP,reg);
        value=inportb(DATAP);
        return (value);
}
        int val;
        int data[2];
        SetIndexData();
        open
        val=read(0x2c);
        val&=0xfe;
        val|=0x02;
        write(0x2c,val);          //select GPIO4 as GPIO
        write(0x07,0x09);
        write(0x30,0x04);
        write(0xf4,0x0f);         //select GP40~GP43 in; GP44～GP47 out;
        write(0xf6,0x00);
        write(0xf5,0x00);
        sleep(1);
        write(0xf5,0xf0);
```

Please visit http://www.evoc.com for more information.

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安全使用小常识

1. 产品使用前，务必仔细阅读产品说明书；
2. 为避免人体被电击或产品被损坏，在每次对板卡进行拔插、重新装配或配置前，须先关闭交流电源或将交流电源线从电源插座中拔掉；
3. 在需对产品进行搬动时，务必先将交流电源线从电源插座中拔掉；
4. 当产品需增加 / 减少板卡时，务必先拔掉交流电源；
5. 当需连接或拔除任何信号线前，须确定所有的电源线事先已被拔掉；
6. 为避免频繁开关机对产品造成不必要的损伤，关机后，应至少等待 30 秒后再开机；
7. 如果要进行升级或拆装等动作，须在静电放电工作台上完成所有操作，因为有些精密器件对静电放电（ESD）很敏感；
8. 如果没有静电放电工作台，可通过以下方法降低 ESD 可能造成的危害：
   a) 戴上一条防静电腕带并与相应产品的金属部分相连；
   b) 在触摸产品部件前，先触摸相应产品机箱上的金属壳；
   c) 当插拔部件时，身体最好与产品的金属机箱保持接触，以释放静电；
   d) 避免不必要的走动；
   e) 拿产品部件（尤其是板卡）时仅拿住边缘；
   f) 将产品部件置于一个接地的无静电的操作平台上。如果可能的话，使用一块导电泡沫垫（非部件的包装材料）；
   g) 不要让部件在操作平台上滑动。
9. 用十字螺丝刀进行操作，最好是强力螺丝刀（带磁性，避免螺丝遗留在机箱内）。要注意的是，一定不要将工具或零件遗漏在机箱内；
10. 保证系统良好的散热与通风。

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第一章　产品介绍

简介

MEC-5004 是一款 Core 2 Duo 双核低功耗无风扇嵌入式原装整机，机箱采用铝合金型材，具有良好密封防尘、散热与抗震性能；主板采用最新的 Intel Core2 DuoU7500 或 L7500 低功耗处理器，Intel GM965+ICH8M-E 芯片组，集成 GMAX3100 图形处理，最大共享显存，支持 VGA、DVI 独立双显，可广泛用于车载导航系统、智能交通系统、数字视频监控系等行业。

主要功能介绍

微处理器

Intel Core Duo U7500/L7500。

系统芯片组

Intel GM965+ICH8M-E。

系统存储器

一条 SODIMM 插槽，最大支持 2GB DDR2 533/667MHz 内存。

网络功能

一个 PCI-E x1 RTL8111C 千兆网络芯片,一个 Intel 82566MC 千兆网络芯片。

视频功能

内置 Mobile Intel® Graphics Media Accelerator X3100 图形加速控制器，支持 LVDS 输出模式，且 LVDS 与 CRT 可同时显示，并支持电视输出。

音频功能

板载一个标准的 AC’97 音效芯片，提供优质的声音效果。

扩展总线

一个 PCI-E 扩展槽，一个 PCI 扩展槽。

IO 接口

- 前面板提供四个 USB 接口，一个 PS/2 键盘鼠标接口，一个 S-video 接口，一组音频接口；
- 后 IO 板提供两个千兆网口，一个 VGA 接口，一个 DVI 接口，一个 GPIO 接口，五个 COM 口，两个 USB 接口。

电源选择

宽压 DC9V～36V/DC12V 双输入，冗余供电。

主要性能指标

机械尺寸、重量与环境

- 外形尺寸：242.00mm(W)x265.00mm(D)x100.00mm(H)；
- 重量：4.5Kg；
- 工作温度：-10° C～+55° C；
- 相对湿度：RH=93%(无结露)；
- 储存要求：-40° C～+60° C。

电磁兼容性

1.产品电磁干扰限值

- GB 9254-1998 无线电骚扰限值的 A 级。

- GB/T17625.1-1998 谐波电流符合 D 类要求。

2.产品电磁抗干扰能力

- GB/T17626.2-98 静电放电抗扰度试验的 3 级。
- GB/T17626.3-98 射频电磁场辐射抗扰度试验的 2 级。
- GB/T17626.6-98 射频场感应的传导骚扰抗扰度的 2 级。
- GB/T17626.4-98 电快速瞬变脉冲群抗扰度试验的 2 级。
- GB/T17626.11-98 电压暂降、短时中断和电压变化抗扰度试验。
- GB/T17626.5-99 浪涌（冲击）试验的 2 级。

可靠性

- 平均无故障工作时间：MTBF≥50000h；
- 平均维修时间：MTTR≤0.5h。

安全性

满足 GB 4943 中 1.7 标记与说明和 2.3、2.9 电气结构的要求。

机械环境适应性

- 抗振动：5-19Hz 周期/1.2mm 振幅；19-200Hz/1.2g 加速度；
- 抗冲击：15g 加速度，11ms 周期。

运输与贮存要求

- **运输：**

包装好的产品能以任何交通工具,运往任何地点，在长途运输时不得装在敞开的船舱和车厢中,中途转运时不得存放在露天仓库中,在运输过程中不允许和易燃、易爆、易腐蚀的物品同车（或其他运输工具）装运，并且产品不允许经受雨、雪或液体物质的淋袭与机械损坏。

- **贮存:**

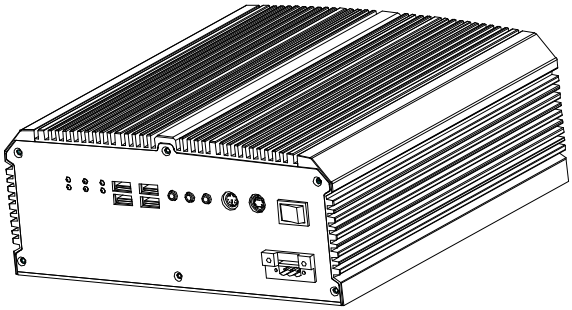
产品贮存时应存放在原包装箱内,存放产品的仓库环境温度为 0℃～40℃，相对湿度为 20%～85%.仓库内不允许有各种有害气体、易燃、易爆炸的产品及有腐蚀性的化学物品，并且无强烈的机械振动、冲击和强磁场作用。包装箱应垫离地面至少 10cm，距离墙壁、热源、冷源、窗口或空气入口至少 50cm。

常见故障处理

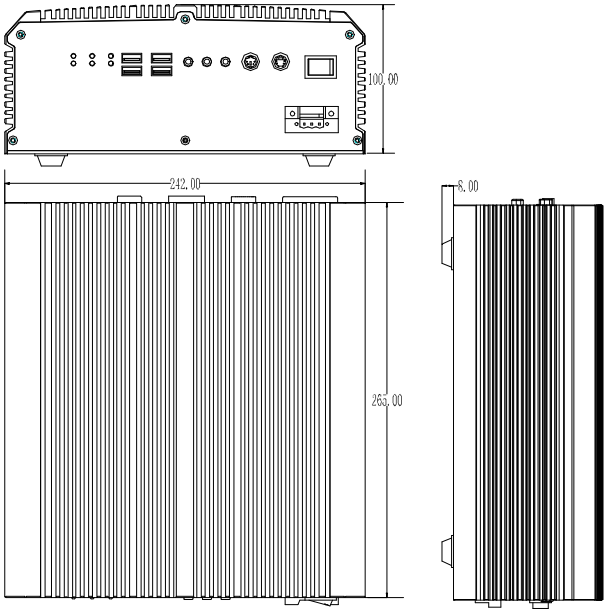
产品的常见故障处理请参见《工业计算机常见故障分析和处理》，在此不多述说。

第二章　安装说明

产品外观图

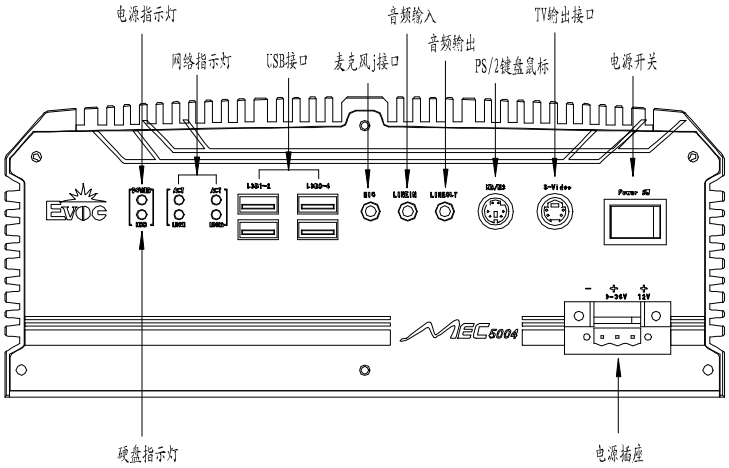


产品安装尺寸图

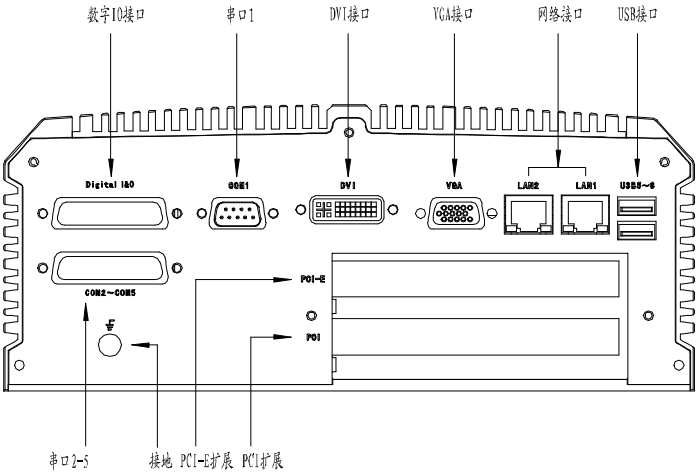


单位：mm

外部 IO 接口图

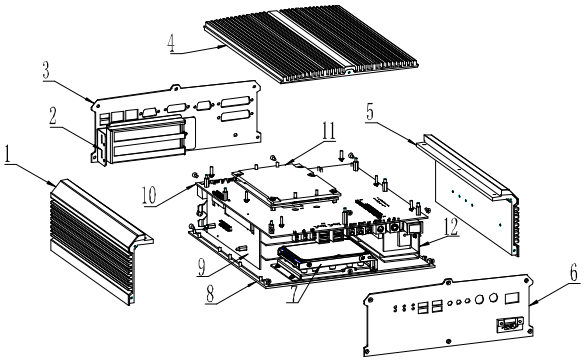


前面板 IO 接口图



后面板 IO 接口图

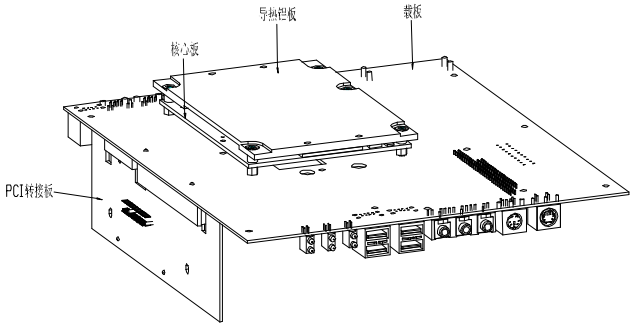
装配说明



1、左侧板	2、I/O 架	3、后面板
4、上盖	5、右侧板	6、前面板
7、硬盘组件	8、底盖	9、PCI 转接板
10、载板	11、导热铝板	12、电源组件

主要载板安装说明

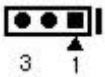
机器核心板组装时,需将导热铝板、核心板、载板先组装一起，再与机器装配，确保核心板与载板接口连接可靠。PCI 转接板直接插入载板插槽接口上,再用螺丝锁在左侧板上即可。



特殊接口介绍

可通过设置底板上的跳线来选择使用不同接口模式的需求。

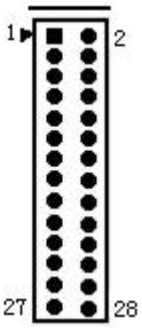
3. CompactFlash 电源选择（JCF1）



JCF1

设置	功能
[1-2]短路	+3.3V
[2-3]短路	+5V(Default)

4. COM1 RS-232/RS-422/RS-485模式选择（JPCOM1）

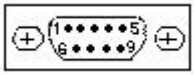


JPCOM1

设置	功能
[1-2]短路 [3-4]短路 [5-6]短路 [7-8]短路 [9-10]短路 [11-12]短路 其它管脚断开	RS-232 模式
[13-14]短路 [15-16]接路 [17-18]短接 [19-20]短接 [21-22]短接 [23-24]短接 其它管脚断开	RS-422 模式
[17-18]短接 [19-20]短接 [21-22]短接 [23-24]短接 [25-26]短接 [27-28]短接 其它管脚断开	RS-485 模式

串口与数字 IO 接口

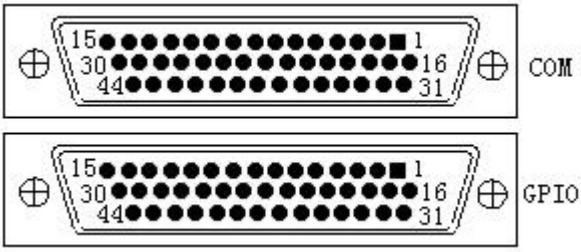
提供五个串口和两组八路输入输出数字 IO 接口，其中一个串口是标准的 DB9 接口（COM1），通过跳线设置可以实现 RS-232/RS-422/RS-485 模式选择；另外由 J1 接口转出 COM2、COM3、COM4、COM5 四个串口，可以连接具有 RS-232 标准接口的鼠标、调制解调器、数码相机等设备。



COM1

管脚	信号名称		
	RS-232	RS-422	RS-485
1	DCD#	TXD-	Data-
2	RXD	TXD+	Data+
3	TXD	RXD+	X
4	DTR#	RXD-	X
5	GND	GND	GND
6	DSR#	X	X
7	RTS#	X	X
8	CTS#	X	X
9	RI#	X	X

COM2、COM3、COM4、COM5 与 GPIO 接口定义：



J1

管脚	COM2、COM3 信号名称	管脚	COM4、COM5 信号名称
1	COM2_DCD-	23	GND
2	COM2_RXD	24	COM4_DTR-
3	COM2_TXD	25	COM4_DSR-
4	GND	26	COM4_RTS-
5	COM3_DCD-	27	GND
6	COM3_RXD	28	COM5_DTR-
7	COM3_TXD	29	COM5_DSR-
8	GND	30	COM5_RTS-
9	COM4_DCD-	31	COM2_CTS-
10	COM4_RXD	32	COM2_RI-
11	COM4_TXD	33	GND
12	GND	34	GND
13	COM5_DCD-	35	COM3_CTS-
14	COM5_RXD	36	COM3_RI-
15	COM5_TXD	37	GND
16	COM2_DTR-	38	GND
17	COM2_DSR-	39	COM4_CTS-
18	COM2_RTS-	40	COM4_RI-
19	GND	41	GND
20	COM3_DTR-	42	GND
21	COM3_DSR-	43	COM5_CTS-
22	COM3_RTS-	44	COM5_RI-

注意：COM2、COM3、COM4、COM5 四个串口与外接线材丝印对应关系如下：

串口	COM2	COM3	COM4	COM5
丝印	D	C	B	A

管脚	GPIO 信号名称	管脚	GPIO 信号名称
1	INPUT0	23	OUTPUT7
2	INPUT1	24	GND
3	INPUT2	25	GND
4	INPUT3	26	GND
5	INPUT4	27	GND
6	INPUT5	28	GND
7	INPUT6	29	GND
8	INPUT7	30	GND
9	GND	31	VCC3.3
10	GND	32	VCC3.3
11	GND	33	GND
12	GND	34	GND
13	GND	35	GND
14	GND	36	GND
15	GND	37	GND
16	OUTPUT0	38	GND
17	OUTPUT1	39	GND
18	OUTPUT2	40	GND
19	OUTPUT3	41	GND
20	OUTPUT4	42	GND
21	OUTPUT5	43	GND
22	OUTPUT6	44	GND

第三章 BIOS 功能简介

BIOS 相关功能简介请参照我公司的《AMI BIOS 设置指南》。

第四章　驱动程序安装说明

本产品的驱动程序可依据整机配套光盘内容安装，在此不做介绍。

附录

数字 IO 编程指引

```
#define open {outportb(INDEXP,0x87); outportb(INDEXP,0x87); }

int INDEXP=0x2e;
int DATAP=0x2f;
int HardwareID=0;

short SetIndexData()
{
     outportb(INDEXP,0x87);
     outportb(INDEXP,0x87);
     outportb(INDEXP, 0x20);
     HardwareID = inportb(DATAP);

     if(HardwareID==0xff)
     {
          INDEXP= 0x4e;
          DATAP = 0x4f;
     }
     return    0;
}

void write (int reg ,int data)
{
     outportb(INDEXP,reg);
     outportb(DATAP,data);
}

int read(int reg)
```

```
{
    int value;
    outportb(INDEXP,reg);
    value=inportb(DATAP);
    return (value);
}
    int val;
    int data[2];
    SetIndexData();
    open
    val=read(0x2c);
    val&=0xfe;
    val|=0x02;
    write(0x2c,val);   //select GPIO4 as GPIO
    write(0x07,0x09);
    write(0x30,0x04);
    write(0xf4,0x0f);  //select GP40~GP43 in; GP44～GP47 out;
    write(0xf6,0x00);
    write(0xf5,0x00);
    sleep(1);
    write(0xf5,0xf0);
```

若想获得更详细的资料可至我公司网站WWW.EVOC.COM查询。